ABSTRACT

Title: Forward Modeling of Atmospheric carbon dioxide in GEOS-5:

Uncertainties Related to Surface Fluxes and Sub-Grid Transport

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Forward GEOS-5 AGCM simulations of CO2, with transport constrained by analyzed meteorology for 2009-2010, are examined. The CO2 distributions are evaluated using AIRS upper tropospheric CO2 and ACOS-GOSAT total column CO2 observations. Different combinations of surface CO2 fluxes are used to generate ensembles of runs that span some uncertainty in surface emissions and uptake. The fluxes are specified in GEOS-5 from different inventories (fossil and biofuel), different data-constrained estimates of land biological emissions, and different data-constrained ocean-biology estimates. One set of fluxes is based on the established "Transcom" database and others are constructed using contemporary satellite observations to constrain land and ocean process models. Likewise, different approximations to sub-grid transport are employed, to construct an ensemble of CO2 distributions related to transport variability. This work is part of NASA's "Carbon Monitoring System Flux Pilot Project."